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Conifers. The Conifers in the Arboretum on the whole look fairly well considering the exceptional severity of the winters of 1917-18 and 1919-20. None of them have been killed this year; and the Black Pines of Japan (*Pinus Thunbergii*), which lost most of their leaves and suffered from the winter perhaps more than any conifer in the collection, are now thinly covered with young leaves, and if the coming winter is not too cold these trees, which had been growing in the Arboretum for twenty-seven years in perfect health, may entirely recover. Young plants of the Mexican White Pine (*P. ayacahuite*) and the California form of *Abies concolor* which lost most of their leaves are now covered with a new crop. Several plants of the variety of *Abies homolepis* with gray cones (var. *umbellata*) have been injured by cold, and this variety has generally proved to be a less desirable ornamental tree in the Arboretum than the blue-coned *A. homolepis*: the leaves are lighter-colored, and in habit the trees of the variety are more open and irregular, and are not worth general cultivation in this country. The Chinese Hemlock, *Tsuga chinensis*, was again badly injured by the winter and there now seems to be little hope that this interesting tree will be able to adapt itself to the New England climate. Trees of doubtful hardiness here, like *Abies grandis*, *Picea Breweriana*, *Tsuga heterophylla*, *Libocedrus decurrens*, *Chamaecyparis Lawsoniana*, and *Cryptomeria japonica* have in exceptionally protected positions been uninjured. The new Spruce-trees from the Chinese Tibetan border-land appear to be all hardy with the exception of *Picea Sargentiana* which has grown badly and is less hardy than the others. It is not probable that this tree will ever grow to a large size in this climate. The new Firs from western China have not grown as well as the Spruces, and, judging by the present appearance of the plants in the Arboretum, give little

promise of usefulness in this climate. All the new Chinese Pines are uninjured and are growing rapidly, but unfortunately the borer which disfigures the native White Pine (*Pinus Strobus*) and the Himalayan White Pine (*P. excelsa*) kills nearly every year the leader of the Chinese White Pine (*P. Armandi*). One of the Korean Firs (*Abies holophylla*) was first raised in the Arboretum sixteen years ago. It has proved perfectly hardy here and has grown rapidly, but the leaves are too yellow to make it a really ornamental plant. Possibly, however, the yellow leaves are due to improper or insufficient nourishment. Wilson from his journey in Korea brought back a large quantity of the seeds of this fine tree which he found making great forests in the northern part of the country, and for the plants raised here from these seeds it may be possible to find the soil and situation *Abies holophylla* requires.

Now that they have passed uninjured through such severe winters the statement often made in these Bulletins may be made again, that the best conifers which have been brought into Massachusetts from other parts of the United States and from foreign countries are the Carolina Hemlock (*Tsuga caroliniana*), the White Fir of Colorado (*Abies concolor*), the *Abies homolepis* of Japan, the so-called Red Cedar (*Thuja plicata*) of the northwestern part of this country, the Serbian Spruce (*Picea omorika*), the western White Pine (*Pinus monticola*) the Japanese White Pine (*Pinus parviflora*), the Golden Larch (*Pseudolarix amabilis*), and the Rocky Mountain form of the Douglas Spruce (*Pseudotsuga taxifolia*); and to this list must be added, although they are not true conifers, the Chinese *Ginkgo biloba* and the forms of the Japanese *Taxus cuspidata* which many persons believe is the most valuable plant Japan has sent to the United States.

Tsuga caroliniana was first raised at the Arboretum in 1884. The plants have grown more rapidly than those of the northern Hemlock (*T. canadensis*) and are now handsome trees with their lower branches resting on the ground. Even in the most exposed positions they have not suffered from cold; and in the Arboretum the Carolina Hemlock has proved to be one of the handsomest of the conifers which can be grown in Massachusetts. Seeds of the Colorado form of *Abies concolor* were first planted in the Arboretum in 1874 and the tallest plant in the collection is nearly sixty feet high and a perfect cone from the ground up. Like all Firs in this climate, this tree will sooner or later lose its lower branches, but for forty years at least the Colorado White Fir as an ornamental tree can be depended on here. The value of the Japanese *Abies homolepis* in the eastern states is less well known as this handsome tree is still rare in American collections, but with our present knowledge it is safe to speak of it as one of the best of the exotic conifers hardy in New England. It was not planted in the Arboretum until 1882, but the three largest specimens in the country, the one planted by Mr. Dana at Dosoris, Long Island, and those in the Hunnewell Pinetum and at Holm Lea, Brookline, Massachusetts, are now from fifty to seventy feet tall and furnished to the ground with branches. In the coast region of the northwestern states and of British Columbia *Thuja plicata* grows to a great size and is one of the handsomest and most valuable timber trees of North America. It ranges eastward to the mountains of Idaho and northern Montana; and

from this cold interior region it was brought to the Arboretum in 1879. It is the largest and handsomest of the *Arborvitæ*s and has proved to be one of the most satisfactory conifers which have been planted in the Arboretum. There are several specimens of the Serbian Spruce in the collection planted in 1886. It is perfectly hardy and one of the handsomest Spruce-trees which can be grown here. Unfortunately the leader is too often destroyed by the borer which disfigures *Pinus Strobus* and other White Pines. What is probably one of the best specimens in the United States of that form of *Pinus parviflora* with wide-spreading branches so common in Japanese gardens has been growing in the Arboretum since 1881. There is also a specimen here of the wild form of this tree from the forests of northern Hondo which was once called *Pinus pentaphylla*. Fortunately *Pinus parviflora* is not injured by the borer which destroys the leaders of many White Pines, but it is somewhat disfigured by the cones which are very numerous, and, persistent for a long time on the branches, turn nearly black before falling. *Pseudolarix*, the so-called Golden Larch of Japan, is one of the handsomest and hardiest exotic trees which can be grown in the eastern United States into which it was introduced more than sixty years ago. It was not planted in the Arboretum until 1891, but the trees here are large enough to show their beauty and are already producing seeds. *Pinus monticola*, the western White Pine, is not as handsome as our native *Pinus Strobus* and will probably never be much planted in the eastern states. It is interesting, however, as the only Pine-tree of western North America, one of the chief homes of the genus, which is really hardy in the east. It has not yet been injured here by borers. The Rocky Mountain form of the Douglas Spruce is now too well known in eastern plantations to require comment.

Junipers. The Arboretum collection of Junipers has improved in the last three or four years and now contains many interesting and healthy plants. It must be remembered, however, that the northeastern part of the United States has not the climate needed for the large number of the species which grow naturally either in warmer countries or in regions of small summer rainfall or of high altitude. The range of variation of the so-called Red Cedar, *Juniperus virginiana*, although a much handsomer plant south of New England than it is here, is now well shown in the Arboretum collection which contains eighteen named varieties of this tree. Nearly all of these varieties are distinct, but in some cases the same or nearly the same plant has come to the Arboretum under more than one name. In color the most distinct of the varieties of the Red Cedar is the var. *glauca* with steel gray leaves, represented in the collection by a number of plants varying somewhat in habit but little in color. This form has not been attacked here by the red spider or by the other insects and the diseases which often disfigure and sometimes kill the common green-leaved form of this tree in Massachusetts. With the exception of *Abies concolor* this Juniper is the handsomest of the gray-leaved conifers which can be grown in this climate. *Juniperus virginiana globosa*, a plant with a cylindric, round-topped little head which came from a Dutch Nursery, is interesting to the students of the now popular dwarf conifers. More beautiful is another Dutch form (var. *Kosteriana*), a flat-topped shrub from two to

three feet high, with long, wide-spreading branches and open habit. This is a useful plant when it can be given sufficient space in which to spread, but is of course more open in habit than that form of the Red Cedar which sometimes grows on the exposed sea-cliffs of the Maine coast, and in such positions forming a wide mat only a few inches high, is perhaps more beautiful than any other prostrate Juniper. Seedlings and grafted plants of this form are growing in the Arboretum but are too young to show if they can retain in more favorable surroundings the extreme prostrate habit due no doubt, in part at least, to the exposed position of the wind-swept sea-cliffs where these plants have grown. Among conifers with more or less pendulous branches few are more beautiful than the pendulous form of the Red Cedar (var. *pendula*). There are several of these trees in the collection, sent here from European nurseries or found in the country. They vary slightly among themselves but are all worth a place in the garden. Among the other varieties of the Red Cedar are several of compact habit and bright green leaves. The most distinct of these are perhaps the varieties *elegantissima*, *pyramidalis*, *Schottii* and *Chamberlaynii*. They probably originated in European nurseries from which they came to the Arboretum.

The Juniper of northeastern continental Asia, *J. chinensis*, is a valuable tree and many of the varieties, especially those of dwarf habit, are popular. Some of these varieties are good garden plants, but others are usually so disfigured by the red spider that unless they are frequently and carefully sprayed they are not worth growing. The best of these dwarf plants, the var. *Pfitzeriana*, is a shrub with irregularly placed rather pendulous branches, which can be trained into a low broad pyramid a few feet high. The branches are sometimes broken by a heavy weight of snow, but nothing else seems to trouble this plant. There are other dwarf upright forms of the Chinese Juniper with green or with bright yellow leaves which are growing well here; and the form with prostrate branches forming a dense low mat found by Professor Sargent in Japan and named for him is the best of the Asiatic prostrate Junipers in the collection. An even more prostrate plant, in this climate, at least, the most reliable and the fastest growing of prostrate Junipers is the North American *Juniperus horizontalis*. This is widely distributed from the sea-cliffs of the coast of Maine to the northern Rocky Mountains. The behavior here of *Juniperus conferta* is disappointing. It is the Japanese sand-dune prostrate Juniper, ranging from Saghalin in the north to the tropical Lu-chu Islands in the south. It was first noticed by Europeans on the shore of Hakkodate Bay in the extremely cold climate of southern Hokkaido. A plant from this region might be expected to be hardy here and it is believed that this Juniper would prove useful to plant on the sand-dunes of Cape Cod and other parts of the north Atlantic coast. In the Arboretum, however, it exists only in sheltered positions and loses many branches every winter. This tenderness is due perhaps to the fact that it grows so late in the season that young wood does not become thoroughly ripened. When the right place is found for it *Juniperus conferta* with its pale green leaves will be one of the handsomest and most distinct prostrate Junipers.

These Bulletins will now be discontinued until next spring.

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